EFFECTS OF MAYDAY ON FIREFIGHTERS AND IC

Effects of Mayday on Firefighters and Incident Commander

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where language of other is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of another.

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Abstract

The Green Bay Metro Fire Department (GBMFD) had not fully analyzed the effects of mayday on firefighters other than the firefighter who called the mayday. The purpose of the research was to determine what the effects may be and what adaptive challenges the incident commander will face so that appropriate actions may be taken by incident commanders. This Applied Research Project (ARP) used descriptive research methods to determine mayday effects and provide recommendations to overcome the associated adaptive challenges.

The procedures used for this ARP were a literature review, distribution of a questionnaire, and interviews with personnel having experienced another firefighter's mayday declaration. Responses to the questionnaire were collected and analyzed using an electronic tool. The research questions were: What is the emotional response of firefighters after hearing another firefighter call a mayday? What is the physiological response of firefighters after hearing another firefighter call a mayday? Do visual cues impact a firefighter's response to another firefighter calling a mayday? What challenges do these responses present to an incident commander?

Using questionnaire and interview results, GBMFD firefighters were found to react in an expected and predictable manner to highly stressful, dangerous situations. GBMFD firefighters' reactions to these situations are expected to present adaptive challenges to an incident commander during a mayday incident. Research also suggested that the commander's reaction may also present challenges. Three recommendations are provided to assist an incident commander to overcome the adaptive challenges associated with a mayday declaration.

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Introduction

When firefighters on an incident scene call a mayday, the scene will immediately change to include a high priority effort to rescue the personnel in distress. A mayday is a relatively uncommon occurrence that will most likely cause a sudden reaction, both mentally and physically, by all personnel who hear it. The human body has a predetermined set of responses that commonly occur when a person encounters a dangerous or highly stressful situation. The responses will typically cause significant psychological and physiological changes to the firefighters encountering the dangerous or stressful situation (Tucker, 2013). Once the body initiates these responses, they cannot be stopped (Patrick, 2012). These psychological and physiological changes may impact a firefighter's ability to perform in the moments immediately following another firefighter's mayday and throughout the duration of the incident. Any impact on a firefighter's ability to perform his/her assigned tasks must be acknowledged and understood by incident commanders.

Fires encountered by modern firefighters develop more rapidly than fires of just a decade ago, causing flashover more quickly. Modern fuel loading coupled with current building construction methods lead to loss of structural integrity faster than ever before (Jaehne, Clark, McCastland, Norman, & Smits, 2007). As a result, firefighters are arriving on scene just as fires are reaching or are already in their most dangerous stage. It stands to reason that with the increasing severity of fires that firefighters will potentially find themselves in a situation where they must call a mayday more often to get immediate assistance. If mayday calls become more common, incident commanders must become proficient at managing a mayday response. To do

that, incident commanders must understand the impact that a firefighter calling a mayday has on other firefighters on the scene.

When firefighters hear another firefighter call a mayday, they are trained to react. What firefighters and incident commanders may not understand is how they will involuntarily react. Given that a mayday situation is an uncommon event that typically occurs while engaged in dangerous activities, the brain and body will most likely both go into a state of alert or alarm caused by the stress of the situation. Patrick (2012) states that there are three stages of alarm: Alarm, Resistance, and Exhaustion. Patrick states that the single most important emotion that sends the body and brain into alarm is fear. While most firefighters would probably struggle to admit that they felt fear when someone else called a mayday, they may be misunderstanding why fear is a common response. Fear may or may not come from believing that they will personally be harmed or killed, but from concern for the person calling the mayday or fear of not being able to help the person (Patrick, 2012). The problem is that that the Green Bay Metro Fire Department (GBMFD) has not fully analyzed the effects of a mayday on firefighters other than the firefighter who called the mayday. This is a problem because a person's reaction to a high-stress, fear-inducing situation cannot be stopped, but with some understanding of the process it could be controlled and may even be somewhat beneficial.

The purpose of this research is to determine what the effects may be and what adaptive challenges the incident commander will face so that appropriate actions can be taken by incident commanders. This project uses descriptive research to determine how firefighters currently react to the stress and fear associated with a mayday call from another firefighter and what adaptive challenges those reactions pose to an incident commander. This research addresses the following questions: What is the emotional response of firefighters after hearing another firefighter call a

mayday? What is the physiological response of firefighters after hearing another firefighter call a mayday? Do visual cues impact a firefighter's response to another firefighter calling a mayday? What challenges do these responses present to an incident commander?

Background and Significance

Green Bay, Wisconsin covers approximately 46 square miles located in Brown County at the confluence of the Bay of Green Bay and the Fox River. The river bisects almost evenly east and west. The GBMFD is charged with protecting approximately 105,000 residents of Green Bay, and almost 15,000 residents of the Village of Allouez, which covers approximately five square miles. The GBMFD also secures one of Wisconsin's busiest ports, multiple international manufacturers and the seventeenth most valuable sporting franchise in the world (Badenhausen, 2013; Lichtman-Bonneville, Leong, & Russell, 2010). Green Bay is the third largest city in the state of Wisconsin.

The Green Bay Fire Department merged with the Village of Allouez Fire Department in December 2012 to form the GBMFD (Village of Allouez, 2013). The department operates out of eight fire stations staffed by 196 career employees. GBMFD consists of 183 line positions and 13 administrative and support positions. Services provided by the department include fire suppression, fire and injury prevention, technical rescue, hazardous materials and Emergency Medical Services (EMS) of advanced life support treatment and transport. The GBMFD responds to over 10,000 incidents annually. Since February 2009, the department has been a partner in the Mutual Aid Box Alarm System (MABAS), which includes thousands of other fire departments throughout the Midwest (Daul, 2008). This agreement enables the department to provide aid to other communities or receive aid when needed.

In 2006, the GBMFD experienced the line of duty death of a lieutenant and the career-ending injury of an engineer in a single incident (Phillips et al., 2007). In that incident the lieutenant called a mayday. This author was on the scene as a firefighter that day and recalls experiencing unique reactions after hearing the mayday and throughout the rescue and recovery operations. Along with personal experiences, the author also recalls witnessing similar reactions in other firefighters on the scene. However, it wasn't until years later after some significant research that the author began to understand these reactions.

In 2009, several GBMFD firefighters were operating on the second floor a large Victorian style home that was on fire. While searching for fire in the home's balloon frame, conditions rapidly deteriorated. The crew was quickly overrun by flames and engulfed in heavy smoke (Jansen, 2009). A mayday was not declared, but crewmembers later stated that the situation warranted a mayday and that one should have been called.

In 2011, a GBMFD captain declared a mayday after realizing that two of his crew members had become separated from him while working a fire in the basement of a large industrial complex (Sponholtz, 2011). Both crewmembers were quickly located and the situation was mitigated. This author was also on the scene of that incident and was assigned as the operations chief immediately after the mayday was declared but before it was mitigated. The incident clearly rattled some of the firefighters on the scene as they displayed somewhat similar reactions to those witnessed in 2006.

While fighting a large apartment building fire in May 2013, a GBMFD captain fell backward while opening a concealed space in search of fire extension (Ruggles, 2013). The captain's self-contained breathing apparatus face mask and helmet were knocked off and he was

immediately exposed to thick, toxic smoke. The captain's crew ultimately assisted him to a nearby window where they escaped the building. This author was on the scene of this incident as well, serving as the incident commander. Subsequent interviews with the captain and crew indicated that they had significant alarm reactions to the situation. While no mayday was called in this situation, it fits the parameters of when a mayday should be called and exhibits the increasing frequency with which maydays may occur.

Prior to 2006, there were no recorded mayday incidents and no line of duty deaths within the GBMFD. While there were undoubtedly incidents in which personnel were in life-threatening situations they did not ask for assistance and either self-rescued or where assisted by those in the immediate vicinity. The recent focus on mayday training by the fire service in general and the GBMFD specifically probably explains why there were no mayday calls prior to 2006 (Green Bay Fire Department, 2007). Nevertheless, the prevalence of mayday declarations and mayday responses appears to be on the rise, as a result of increased awareness and training as well as a changing fire environment.

Mayday scenarios may not be limited only to fire incidents. In 2012, a GBMFD paramedic was briefly held at gunpoint by a patient while on an EMS response. No personnel were physically harmed during the incident, but the paramedic exhibited signs of an alarm response by hastily exiting the residence when the opportunity presented itself and after warning other responders. The paramedic did not declare a mayday because of concern about what the patient would do if he attempted to use his radio (Isley, 2012). However, this situation illustrates how a mayday could potentially result from incidents other than fire incidents.

As the incidence of structure fires in the United States of America continues to decrease, structure fires are becoming low-frequency events, meaning they do not occur very often (United States Fire Administration, 2013b). However, the fires that are occurring are becoming more dangerous due to fuel loads and construction type (United States Fire Administration, 2013a). Based on experience, it is generally accepted that the occurrence of mayday declarations at a fire scene or EMS scene is relatively low. Given a decreasing number of fires and low occurrence of maydays, it is evident that a mayday on an incident scene is a low-frequency, high-risk event. Graham (2004) states that low-frequency, high-risk events are where most errors happen and consequences are the worst. Graham further states that a low-frequency, high-risk event with little or no time to think through a response, or non-discretionary time, is the absolute worst situation to be in. Given the need to act immediately to rescue personnel who are in danger, a mayday incident can certainly be described as a non-discretionary time event.

This research is significantly important to the GBMFD because of the increased prevalence of mayday declarations by personnel. The research is also important because of the increase in occurrence of situations in which a mayday should be called but is not. The recent merger of the department will likely result in an increase in incident volume, creating even more situations in which a mayday could be declared. It is imperative that incident commanders and firefighters understand what psychological and physiological reactions will occur in the event of a mayday in order to effectively respond

This applied research project is relevant to the coursework of the *Executive Leadership,* R0125 course of the National Fire Academy's Executive Fire Officer Program (EFOP) ((NFA), 2012).The project addresses the following objectives of the *Executive Leadership* curriculum:

Unit 2: Giving and Using Feedback implied that a leader must be able to address difficult issues to bring about change. Specifically, the unit discussed having difficult conversations and pointing out the "elephant sitting on the table." With regard to this project, the elephant on the table would be the fear demonstrated by firefighters upon hearing another firefighter declare a mayday. A leader has to demonstrate a willingness to engage personnel on all levels, including the emotional level. Enabling firefighters and incident commanders to understand that fear is a natural reaction that manifests for many reasons is an adaptive challenge. It is also the first step to getting them to understand how to harness and control their fear and other emotions.

Unit 3: Thinking Systematically explained the importance of viewing an issue from a systems perspective and seeing the bigger picture. The issue of a firefighter's response to a mayday is a complicated issue that impacts the firefighter hearing the mayday, the firefighter declaring the mayday, the incident commander, incident operations, and possibly the entire department. The unit described that systems are impacted by social relationships and that a person's reaction to a given situation is at least partially driven by those relationships. Helping firefighters to understand their default response to stress and danger will ultimately allow them to influence cultural acceptance of how people react to a mayday situation. Unit 3 also describes an interconnection between systems and subsystems. The body's response to stress and danger is a systematic response that has been developed over millions of years. The process of declaring a mayday and the operational reaction to it are systems developed by department policy and practice. A training system is used to ingrain the mayday process and resulting reactions into a firefighter's mind. This research helps to understand and demonstrate the interconnection between those systems in a practical application.

Unit 5: Developing Self to Exercise Leadership indicates the challenge of understanding a firefighter's reaction to another's mayday is an adaptive challenge rather than a technical one. Neither the problem nor the solutions are well defined and the work to understand and address it must be done by the firefighters who have a stake in the outcome.

Unit 6: Decisionmaking discusses individual methods of decision making and whether or not subordinates can or should be involved in decision making. Understanding how people make decisions is critical to understanding how their decisions will be affected by stressful situations. Furthermore, this research helps incident commanders and firefighter's understand that decisions will be difficult to make in high-stress situations and that many decisions made by an incident commander are made alone, but only after seeking information.

Unit 10: Storytelling suggests that using organizational stories to exercise leadership can help convey the need for change or action. This research attempts to draw on the experiences of personnel within GBMFD to demonstrate the need to understand how a person reacts to the stress of a mayday situation so it may be appropriately managed.

This project is linked to the strategic goals of the United States Fire Administration by addressing goal number 1: Reduce risk at the local level through planning and mitigation. Understanding how firefighters will react under stressful mayday conditions will enable incident commanders to address corresponding adaptive challenges quickly. If firefighters and incident commanders do not respond efficiently to a mayday, the incident causing the mayday is likely to continue or escalate because resources will be consumed by efforts to respond to the mayday instead. If challenges are overcome more effectively, the mayday and the incident will be mitigated more expeditiously. By virtue of addressing goal number 1, the project is also linked to

goal number 4: Improve the fire and emergency services' professional status. Becoming more effective and efficient by being prepared to handle adverse situations quickly and mitigate incidents in an expedient manner is one hallmark of a professional fire and EMS organization (United States Fire Administration, 2012).

Literature Review

Review of literature relevant to the topic focused on research related to the human reaction to stressful situations. The phenomenon of the body alarm reaction as a result of encountering a stressful situation was reviewed as well. Existing research was consulted regarding the underlying emotion of fear as it results from and is related to stress and body alarm. To further examine the body alarm reaction, research surrounding the fight or flight response was also reviewed.

Firefighting personnel encounter stress on a daily basis while performing their duties and stress has an impact on the ability of personnel to perform assigned duties (Milen, 2009). Milen (2009) states that stress experienced by firefighting personnel requires adaptive measures and comes in many forms, including environmental extremes, noise, and traumatic incidents. Milen (2009) cites Orner (1995) stating that firefighters experience negative thoughts and adverse psychological reactions, along with other reactions, based on the duration of exposure to traumatic incidents.

According to the American Psychological Association (APA), stress comes in multiple forms including chronic stress, acute stress, and acute episodic stress, each of which has its own symptoms and reactions ("Stress: The different kinds of stress," 2013). Acute stress results from immediate, short-term events. The APA (2013) connects acute stress to symptoms of emotional

distress, muscular problems, stomach, gut, and bowel problems, elevated blood pressure, rapid heartbeat and palpitations, dizziness, shortness of breath, and chest pain. The University of Maryland (2013) defines acute stress as the reaction to an immediate threat, commonly known as the fight or flight response. The threat does not have to be real; it can be perceived consciously or subconsciously and may be real or imagined ("Stress - The Bodys Response," 2013). Various substances including hormones, catecholamine, and proteins are released into the body as a result of acute stress, each substance causing the body to react in a certain way to the threat ("Stress - The Bodys Response," 2013). The acute stress response was defined in the 1920s by physiologist Walter Cannon, who recognized that the body was mobilizing for action against a threat based on a series of chain reactions caused by a release of hormones (Cherry, 2013).

The Defense Centers of Excellence states that acute stress reaction is a group of physical, mental and emotional reactions to a difficult environment, which may include witnessing a death or serious injury. The response involves intense feelings of fear, helplessness, or horror ("Fact Sheet: Acute Stress Reaction," 2010). Furthermore, Cline (Cline, 2010) concurs that stress must be caused by a stressor. The stress caused by the stressor results in emotional, physical and behavioral reactions.

Stress cannot be eliminated in our lives and in some cases may be beneficial, especially for first responders (Gasaway, 2012c). Adrenalin and Endorphins are released in the body causing heart and lung reactions and pain blocking respectively (Gasaway, 2012a). According to Gasaway (2012a), additional reactions to the hormonal dump caused by stress include intuitive decision-making, tunnel senses, auditory exclusion, sensory overload, and hyper vigilance. These findings are particularly relevant to this project because the field of public safety attracts type A personalities, who are more susceptible to acute stress (Gasaway, 2012b).

Hyper vigilance is defined by Gasaway (Gasaway, 2012d) as having all senses on high alert for danger. Hyper vigilance can have both a good and bad effect on emergency responders. If operating in a relatively simple scenario, it is good. However, when operating in a complex scenario or incident where everything is constantly changing and may be beyond a firefighter's control, it can be very harmful. As the brain can only effectively deal with up to seven pieces of information at a time, taking in more than that can cause one to be overwhelmed very quickly (Gasaway, 2012d).

Tunnel vision occurs when visual attention is focused on one small area or object, causing things to go unnoticed in the periphery. This phenomenon can also cause diminished or acute hearing (Gasaway, 2012e). According to Patrick (2012), the brain filters any visual information that it deems to be extraneous, which may reduce the field of vision by up to 70%. Tunnel vision has been reported in 51% of police officers engaged in stressful actions (Patrick, 2012).

Diminished hearing caused by stress is referred to as auditory exclusion (Gasaway, 2012f). Auditory exclusion may progress to the point that the brain completely shuts off hearing. This is compounded by the theory that a pulse rate in excess of 175 beats per minute causes noise while moving past the eardrum at a high rate of speed, generating enough noise to drown out ambient noise (Gasaway, 2012f). The brain again filters out noise that it believes is unnecessary, though it may filter out what is important at the same time (Patrick, 2012). Approximately 85% of police officers experiencing high stress situations have reported auditory exclusion according to Patrick (2012).

Gasaway (2012f) states that in a high-stress environment the brain will attempt to make sense of what is happening even if things do not come together correctly. The brain will integrate signals from various senses in an attempt to make sense of everything. One example of this is the McGurk Effect. The McGurk Effect is an illusion created by the brain that appears to make mismatched audio and visual input align. The illusion is used by the brain to better comprehend speech (Nath & Beauchamp, 2012). Gasaway (2012f) predicts that this could have a significant impact on an incident scene as firefighters see one thing with their eyes and hear conflicting information from their ears, possibly over the radio. Vision will outweigh what the ears hear and the brain will ignore the auditory message, processing only the visual message.

Highly stressful situations can also cause the misperception of time, known as tachypsychia, making one feel as though time moves either too quickly or too slowly (Patrick, 2012). Gasaway states that tachypsychia results from high levels of dopamine and norepinephrine being released into the body (Gasaway, 2012g). Consequences of tachypsychia on a fireground could be extremely dangerous when considering that conditions may be deteriorating every minute, especially at a structure fire (Gasaway, 2012g). If it appears that things are not getting done in a timely fashion because of a perceived slowing of time, task fixation could become an issue according to Gasaway (2012g).

The body's reaction to stress is referred to as General Adaptation Syndrome (G.A.S.), Adrenal Stress Response, or Body Alarm Reaction (B.A.R.) (Patrick, 2012). According to Patrick, the response has three segments including the alarm stage, resistance, and exhaustion. The response may be triggered by various emotions but the most important trigger is fear (Patrick, 2012). Patrick states that because the body's reaction to stress and fear cannot be overcome, the best course of action is to attempt to understand it and minimize the effects as

much as possible while optimizing the potential benefit. While people may be conscious that they fear something and that they are reacting in a fearful manner, they cannot eliminate fear by will alone (LeDoux, 1996).

Decision making that occurs during the reaction to stress and fear can best be summarized by looking at the OODA Loop (Patrick, 2012). Colonel John Boyd developed the OODA Loop model for decision making to assist combat pilots. The four points of the OODA Loop are observe, orient, decide, and act ("OODA Loops Understanding the Decision Cycle," 2013). Once a threat is perceived, the brain moves through the OODA Loop phases and determines how to react to the threat by deciding to fight, flee, or freeze. This decision is made by the brain searching first short term and then long term memory for a similar situation that had a satisfactory outcome or developing a response if a memory isn't found (Patrick, 2012).

The observation portion of the OODA Loop relies on witnessing of environmental cues. The cue utilization theory indicates that as the brain's level of arousal due to stress increases, the ability to focus attention decreases. This means that the brain filters out unnecessary information as stress levels increase, but if stress levels are too high the brain will also begin to filter out necessary information (Kent, 2007). Patrick (2012) states that as a result of cue utilization, the arousal from stress can cause an "attentional blink" where a person becomes fixated on a single threat even though multiple threats may be present. Furthermore, Patrick states that it is possible for a person to get stuck in the orientation phase of OODA Loop as he/she tries to process what he/she is observing. As cues continue to arrive at an overwhelming pace, the brain never moves from processing information to acting on it (Patrick, 2012).

Under extreme stress, the body will take over and do things that the mind may not be consciously aware of because it is essentially acting on auto-pilot. The most probable explanation for this is that the actions taken by the body are so ingrained in the brain from training that the brain doesn't need to concentrate on them. One reaction to stress that could impact auto-pilot functioning is the loss of fine motor skills. As part of the fight or flight response, the brain prepares the body to use large muscles, taking focus away from fine motor skills (Patrick, 2012).

If fear is the most likely trigger of body alarm reaction or adrenal stress response, a better understanding of fear is relevant. According to LeDoux (1996) the fear system is not just responsible for the experience of fear, but also for sensing and reacting to danger. It is so much a part of the human defense mechanism that it has the power to cause humans to not feel pain that they normally would. Fear is "pervasive" in that it is what gives action to courage, morality, and social order. Without fear there would be no reason to act courageously, live morally, or follow laws (LeDoux, 1996).

Fear conditions humans to particular stimuli, which would otherwise mean nothing according to LeDoux (1996). A "conditioned stimuli" is something that one learns to react to with typical response, which is called a "conditioned response." Fear conditioning is a variation of Pavlov's discovery that dogs would salivate at the sound of a bell after hearing the bell ring while they ate. Fear conditioning can occur without the subject being consciously aware of it (LeDoux, 1996).

Two fear systems exist: the emergency fear system and the worry system. The two systems interact and can cause a change in how individuals react to a given threat, depending on

how much they are already worried about it (Clarkson, 2003). A certain amount of fear can actually heighten awareness and increase productivity at work. Clarkson asserts that the problem is not fear, but how people cope with fear. Clarkson agrees that the pressure experienced from a fearful situation impairs fine motor skills and focus, but improves effort.

Stress and fear ultimately lead to a fight or flight response. Once the fight or flight response begins, a person has difficulty with conversation and is less of aware of what is happening around him/her because the brain is now only concerned with basic survival (Plaford, 2013). In addition to the options of either fighting or fleeing, the brain may react to stress or fear by initiating a freeze response. This is most likely to occur when the brain perceives little chance of surviving or escaping the threat (Schmidt, Richey, Zvolensky, & Maner, 2007). Clarkson (2003) states that the freeze response sometimes gives the person more time to process information related to the threat. Similar to fight or flight, freezing is an automatic response that can be triggered by either a conditioned stimuli or an innate perception of a threat (LeDoux, 1996). LeDoux states that freezing can also be a form of preparation for fighting or rapid escape when it becomes possible. Fight, flight and freeze are natural responses that have evolved in humans since primitive times (Neimark).

The release of hormones and proteins that occurs through a reaction to stress or fear have a profound effect on the body. The circulatory system will increase pulse and blood pressure immediately. The respiratory system increases breathing rates so that the body can take in more oxygen. Red and white blood cell counts are increased to allow the blood to carry more oxygen to the body. Blood flow increases may be up to 300 to 400%. Fluids will be diverted to critical areas, causing dry mouth and difficulty speaking. ("Stress - The Bodys Response," 2013). Pupils will dilate to increase vision. Blood will be rerouted to larger muscles in preparation for a fight

or an escape. Glycogen, glucose, and cholesterol are all processed immediately to increase energy levels. Changes to blood flow and increased heart rates can degrade some performance. Fine motor skills begin to decline at heart rates over 115 beats per minute. Complex motor skills that involve tracking, timing, and hand-eye coordination begin to suffer at 145 beats per minute. As the body makes these changes, gross muscle movements of the large muscles will improve (Clarkson, 2003; Wise, 2010).

It is clear that there are several ways in which fear and stress impact a firefighter's ability to perform tasks or even comprehend simple messages. In the event that a firefighter hears a mayday declared on an incident scene by a fellow firefighter, research shows that fear will probably be a psychological reaction experienced by many firefighters. That reaction along with the labor-intensive nature of firefighting will cause significant physiological changes as well. Some physiological changes will make it more difficult for firefighters to perform their tasks. Comprehending what response firefighters may have to another firefighter's mayday is critical to ensuring that GBMFD incident commanders understand the impact that stress and fear will have as they assign personnel to mitigate the emergency. Furthermore, GBMFD staff will also be able to use this project to initiate cultural change that promotes an understanding and acceptance of these reactions throughout the department. Finally, knowledge of these reactions will allow GBMFD staff to develop training programs and operational procedures to overcome the adaptive challenges presented in these scenarios.

Procedures

This applied research project (ARP) intends to increase understanding of the effects that a mayday from a firefighter has on other firefighters on an incident scene through a descriptive

research approach. The research examined how a person has reacted or believes he/she would react to dangerous, high-stress situations both psychologically and physiologically. The project also examined whether or not a firefighter felt he/she would be more or less likely to operate outside of or contrary to orders given by company officers or incident commanders during operations to mitigate a mayday situation. A questionnaire was used to solicit descriptors of psychological and physiological responses to mayday declarations by other firefighters. Personal interviews were conducted with GBMFD personnel who had experienced a mayday declaration ending with a line of duty death. The interviews were intended to get a firsthand perspective of a firefighter's reactions and thoughts during a mayday situation.

An Internet link to the questionnaire was sent to firefighters using two different methods. First, the questionnaire was sent to GBMFD personnel using an electronic mail distribution group that included all GBMFD firefighters of all ranks. Second, the questionnaire was distributed using the Wisconsin State Fire Chief's Association list server. Subscribers to the list server include over 1,000 members of the Association. Membership in the Association is open to all fire departments in Wisconsin, including volunteer, combination, paid-on-call, and career. The questionnaire was distributed as widely as was feasible because responses would be relevant regardless of which department or area a firefighter was from. The questionnaire was sent out using both methods on the same day and respondents had 14 days to reply. The duration of the questionnaire's availability was based on allowing reasonable time for all GBMFD shift personnel to respond, including those who may have taken leave during that time. Respondents were informed that their answers were anonymous and participation was not required.

The questionnaire was designed using SurveyMonkey, an online survey and questionnaire tool. The questionnaire included two related sets of questions and questions that all

respondents were to answer. One set of questions was targeted at firefighters who had actually been on an incident when a mayday was declared. The second set of questions was targeted at firefighters who had not been on an incident when a mayday was declared. The "question logic" feature of the tool was used to point each respondent to the appropriate set of questions. The first question was to be answered by all respondents to point them to the appropriate set of questions. The final question was also to be answered by all respondents regardless of whether or not they had experienced a mayday declaration on an incident. As a result of using the "question logic" feature, respondents did not answer every question, which was the intent of using the feature. Standard response choices were provided for all questions; no open-ended responses were allowed. If necessary, multiple responses were allowed for a single question.

The questionnaire was intended solely to assess a firefighter's reaction to a different firefighter's mayday declaration. Each questionnaire question was designed to specifically address a research question for this ARP, with the exception of questionnaire question 1, which was designed to direct respondents to the appropriate set of questions. The questionnaire questions comply with descriptive research methods because they describe how firefighters currently react to mayday declarations of another firefighter. They also generally describe actions that firefighters might take that would pose an adaptive challenge to incident commanders on a mayday scene. Some limitations of the questionnaire and the distribution method do exist. Since the questions are focused on psychological and physiological reactions, the questions may not have included a description of a reaction that a respondent found accurate for what they felt. Additionally, respondents were not allowed to describe any other reactions he/she had. Finally, the distribution of the questionnaire was not strictly controlled but rather widely disseminated.

Interviews were conducted with eight GBMFD firefighters who are known to have been on the scene of an incident in which a mayday was declared and a firefighter died. The interview questions were designed to specifically address the research questions of this ARP. Interviews were conducted in real time during late August and early September 2013. Each interview was approximately 20 minutes long and was conducted either in person or by telephone. The interviews were intended to get multiple accounts of actual reactions to a mayday declaration. The interview also gathered personal viewpoints of the challenges presented to personnel and the incident commander. Interview questions also comply with descriptive research methods because they describe actual actions and experiences of firefighters who have been subject to a mayday declaration and the adaptive challenges present at that scene. All personnel interviewed were informed that they would remain anonymous, and agreed to the interview based on that condition. The limitation to the interview questions and process was that the interviews were conducted in person or by telephone, which may have impeded complete responses if personnel felt their responses would have undesirable consequences; they were assured they would not.

After compilation of all answers, the questionnaire results were compared to information gathered during the literature review. This comparison displayed whether or not firefighters were reacting in an expected manner to a mayday declaration. The comparison also indicates whether or not firefighters who had not experienced a mayday declaration understood what reactions they might have. The results of questionnaire question 11 were analyzed to see what adaptive challenges might be presented to an incident commander during a mayday incident. Responses to interview questions were compared to literature review findings to see if the reactions of GBMFD firefighters known to have been part of a mayday incident were consistent with the findings of other researchers. The interview responses were also compared to the findings of the

questionnaire to determine if known responses of GBMFD firefighters were consistent with other GBMFD firefighters and firefighters from other departments.

Results

Research conducted for this ARP provides a view of what reactions firefighters have had as a result of a mayday declaration and what reactions they believe they may have if they haven't already experienced a mayday declaration. The results of the descriptive research are presented along with the specific research questions answered through the process. There were 323 responses to the questionnaire. The research indicates that GBMFD firefighters do have typical reactions to dangerous and stressful situations. It also indicates that there is some lack of understanding by firefighters who have not experienced a mayday declaration as to how they might react in these situations. Table 1 provides the number of respondents who have and have not experienced a mayday declaration. The questionnaire and answers can be found in Appendix A.

Research question one, What is the emotional response of firefighters after hearing another firefighter call a mayday? was addressed by questions 2, 6, and 7 on the questionnaire. Firefighters who had experienced a mayday declaration indicated having several psychological or emotional responses. Firefighters who had not experienced a mayday declaration felt they would have similar responses. Table 2 displays the four predominant responses from firefighters who have experienced a mayday declaration. Table 3 displays the four predominant responses from firefighters who have not experienced a mayday declaration. It should be noted that 34.3% of firefighters who had experienced a mayday declaration indicated "fear" as a psychological response.

Table 1: Firefighters experiencing a mayday declaration

Have you ever been working on an incident scene at the time that a mayday was declared by a firefighter other than yourself?		
Answer Options	Response %	Response Count
Yes	24.1%	78
No	75.9%	245

Table 2: Four primary psychological responses of firefighters who have experienced a mayday declaration

What psychological response(s) do you recall feeling at the time the mayday was declared or at any time during efforts to resolve the mayday situation? (check all that apply)		
Answer	Response %	Response Count
Anxiety	61.4%	43
Stress	50.0%	35
Hypervigilance	50.0%	35
Surprise	44.3%	31

Table 3: Four primary psychological responses of firefighters who have not experienced a mayday declaration

What psychological response(s) do you believe you would have if you heard a firefighter other than yourself declare a mayday at an incident scene? (check all that apply)		
Answer	Response %	Response Count
Stress	71.0%	149
Anxiety	64.8%	136
Hypervigilance	62.4%	131
Fear	41.4%	87

Research question two, What is the physiological response of firefighters after hearing another firefighter call a mayday? was addressed by questionnaire questions 3, 8, and 9. Firefighters experiencing a mayday declaration indicated having several physiological responses.

Firefighters with no mayday declaration experience felt that they would have similar responses, though response percentages varied significantly. Table 4 displays the four most common responses from firefighters who have experienced a mayday declaration. Table 5 displays the four most common responses from firefighters who have not experienced a mayday declaration.

Table 4: Four primary physiological responses of firefighters who have experienced a mayday declaration

What physiological (physical) response(s) do you recall feeling at the time the mayday was declared or at any time during efforts to resolve the mayday situation?		
Answer	Response %	Response Count
Increased heart rate (fast pulse)	82.9%	58
Increased breathing rate	38.6%	27
Increased blood pressure (pounding pulse)	31.4%	22
Tunnel Vision	20.0%	14

Table 5: Four primary physiological responses of firefighters who have not experienced a mayday declaration

What psychological (physical) response(s) do you believe you would have if you heard a firefighter other than yourself declare a mayday at an incident scene? (check all that apply)		
Answer	Response %	Response Count
Increased heart rate (fast pulse)	95.2%	200
Increased blood pressure (pounding pulse)	74.3%	156
Increased breathing rate	62.9%	132
Tunnel Vision	27.1%	57

Research question three, Do visual cues impact a firefighter's response to another firefighter calling a mayday? was addressed by questionnaire questions 4 and 10. Of firefighters who had experienced a mayday declaration, 71.4% indicated that there were visual cues present that indicated the severity of the emergency when the mayday occurred. That same percentage of

firefighters stated that those visual cues contributed to their psychological and physiological responses. Of firefighters with no mayday declaration experience, 96.2% felt that visual cues would contribute to their psychological and physiological reactions if they heard a mayday declaration.

Research question four, What challenges do these responses present to an incident commander? was addressed by questionnaire question 11. Responses to this question indicate there will be significant adaptive challenges presented to the incident commander. The results indicate there is a high possibility of personnel not following orders if they perceive that their desired course of action would be more beneficial to a firefighter needing assistance. Furthermore, responses indicate firefighters will be more willing to take actions that would place themselves and possibly others in danger if a mayday declaration occurred. Several other questions also provide information related to research question four. Questions 2, 3, 6, 7, 8, and 9 on the questionnaire all indicate that a firefighter's response to a mayday will have effects that make it more difficult to function. Each of those responses provides the incident commander, and the individual, with an adaptive challenge. An unexpected finding stemming from research question four is that firefighters appear more willing to operate outside the orders of the incident commander than those of the company officer. Almost 65% of respondents said they either agreed with or were neutral regarding the statement that they would operate outside of the IC's orders. In contrast, over 60% of respondents disagreed with the statement regarding ignoring the company officers directions, with another almost 27% remaining neutral. Table 6 displays responses related to adaptive challenges presented to incident commanders.

Table 6: Adaptive challenges presented to incident commanders

Place yourself in the position of a firefighter who has just heard another firefighter declare a mayday and rate the following statements:			
Statement	Agree	Neutral	Disagree
More likely to operate outside of IC's orders if I thought it would help the firefighter	38.7%	25.9%	35.4%
More likely to strictly follow the IC's orders even if I thought something else would be more beneficial	40.1%	43.1%	16.8%
Would ignore the company officer's directions if I thought it would help the firefighter	12.5%	26.7%	60.8%
More likely to strictly follow the company officer's orders even if I thought something else would be more beneficial	47.8%	40.9%	11.3%
More willing to place my own life at risk in a mayday situation	77.0%	17.9%	5.1%

Results of interviews conducted as part of this applied research project describe actual reactions experienced by GBMFD firefighters on the scene of a mayday. The interview questions and a summary of all answers can be found in Appendix B. The interviews revealed that firefighters who had experienced a mayday declaration shared common reactions and witnessed common reactions in others. Each interview subject described experiencing or witnessing psychological reactions that included fear, anger, anxiety, disbelief, confusion, and frustration. Two subjects specifically mentioned that time seemed to be moving slowly, or that it was moving quickly, or both depending on what was happening at that moment. One subject stated that the perception of time moving slowly was the reason they were upset when ordered to exit the structure and stop the search. Three subjects stated that they felt a sense of heightened awareness.

Physical reactions witnessed and experienced by the interview subjects included feeling sick, exhaustion, “adrenaline rush,” and racing heart. Three of the subjects stated their hearing was affected, making it either worse or more focused. Two subjects described an adrenaline rush followed by a crash after it wore off. One subject described an experience very similar to the McGurk Effect, stating he thought he heard something but then closed his eyes and listened more closely and realized he was hearing something entirely different. One subject recalled the feeling that he was trying to process an enormous amount of information. A subject recalled that one individual seemed to be processing information and analyzing the situation while not taking any action while a different person froze briefly but did not appear to be processing or analyzing information. Tables 7 and 8 provide a summary of interview responses regarding emotional and physical reactions, respectively.

Table 7: Summary of Emotional (Psychological) Reactions

Fear	Hyper Awareness	Denial
Anxiety	Visual Cues	Disbelief
Time passed slowly	Anger	Surprise
Time passed quickly	Failure	Frustration
Action needed	Intensity	Concern

Table 8: Summary of Physical (Physiological) Reactions

Heart Racing	Adrenaline Rush	Sick to stomach
Exhaustion	Shaking hands	Hearing focused
McGurk Effect	Adrenaline Crash	Hearing worse

Interview subjects provided insight into the possible adaptive challenges that would be presented to an incident commander as well. Six of the eight subjects stated they did not operate outside of any orders or witness anyone else do so. One of the subjects stated he did not operate outside of orders, but felt he should have. One interview subject stated that the second highest-ranking person in the company took control of the company when it was necessary, but the subject did not feel that person operated outside of orders.

Two interview subjects provided responses specific to research question 3 regarding the impact of visual cues. One subject stated that the feeling of fear was made more intense due to witnessing heavy fire exit from several doors and windows of the structure at the time of the mayday. The second subject commented that witnessing what appeared to have been a backdraft just prior to the mayday and passing doors and windows full of fire while walking to enter the structure made his reaction worse.

Those answering the interview questions stated that they felt some adaptive challenges would have to be addressed by the incident commander. Those challenges included personnel not giving full attention to order they are given, communications problems based on how people are reacting, reacting irrationally, increased aggression, operating hastily, and an increased desire for information. One subject suggested that the primary adaptive challenge for an incident commander might be managing the commander's own reaction to the mayday declaration. Another felt some people may perform at different levels than what is common for that person, both positively and negatively, requiring the incident commander to adjust accordingly.

The interviews also revealed that most of those having firsthand experience with a mayday declaration believe that someone experiencing it for the first time will not be prepared

for how his/her mind and body will react. Three people's answers suggested that they believed that people could be trained to some extent to be better prepared for their reactions. One subject stated that no one could understand how he or she will react until experiencing the actual event. All interview subjects stated that one way to overcome the adaptive challenges is to train firefighters and incident commanders on what reactions to expect when a mayday declaration occurs. Subjects also stated that the response of the incident commander would be important in that if the commander is calm, other personnel on the scene will be calm. One subject stated that developing a standard approach to managing a mayday declaration would assist in overcoming challenges as well. Finally, one subject stated that communications challenges could be addressed by establishing a priority communications system for mayday declarations.

Discussion

It is evident that the body has a predetermined reaction to dangerous and stressful situations that cannot be stopped by sheer will (LeDoux, 1996). These reactions cause significant physiological and psychological changes that dictate a person's response to a situation to some extent. LeDoux (1996) states that these reactions are caused by a conditioned stimulus (also referred to as a learned trigger), which elicits a conditioned response. To GBMFD firefighters and other firefighters, the word "mayday" has become a conditioned stimulus. The corresponding conditioned response manifests in a typical fight, flight, or freeze response.

An incident commander's understanding of the reactions that firefighters will have when another firefighter declares a mayday is critical to the success of mitigating the mayday. While the reactions cannot be overcome, they could be beneficial to responders if they understand them (Gasaway, 2012c). Known reactions by GBMFD firefighters closely matched descriptions of

hyper vigilance provided by Gasaway (2012d) and Patrick (2012). Gasaway states that hyper vigilance can be positive in dangerous situations, unless it causes one to be overwhelmed. An incident commander with knowledge of this phenomenon could overcome this challenge by making assignments clear and concise so as not to contribute to overwhelming responders in a hypervigilant state.

According to questionnaire responses, over 90% of the respondents either did experience or expected to experience fear or anxiety in response to a mayday declaration. Among firefighters who have experienced a mayday and firefighters who have not, all indicated both higher incidences of anxiety than fear. Six of eight interview subjects stated that they either personally experienced or witnessed someone experience fear or anxiety during a mayday declaration. According to LeDoux (2012), fear and anxiety are closely related and cause the same reactions.

Of questionnaire respondents who had actually experienced a mayday declaration, 20% indicated they felt as though they were functioning on “auto pilot.” This implies that firefighters in highly stressful situations will revert back to what they have been trained to do. This corresponds to the findings of Patrick (2012). Based on these findings, it can be assumed that firefighters and incident commanders who are trained to respond in a certain way when a mayday is declared will likely do so, rather than getting locked into a mode of simply processing information.

Over 35% of firefighters having experience with a mayday declaration said they perceived some alteration of the sense of time passing. Additionally, over 20% of firefighters not having mayday experience expect to have an altered sense of time passing, or tachypsychia

(Patrick, 2012). Gasaway (2012g) believes that tachypsychia could be extremely dangerous on a fireground. Two GBMFD interview subjects stated that they felt time passed slowly. If incident commanders also feel that time is going slowly, they may place undue pressure on personnel to accomplish assignments more quickly. Furthermore, if personnel feel that time is passing too quickly or too slowly, they may believe the incident commander has not done all that could be done to mitigate a mayday. This will undoubtedly cause stress levels to increase and add to an already challenging situation.

The responses to both the questionnaire and interview questions indicate that GBMFD firefighters' physical responses are in line the responses of other firefighters and with those noted by other researchers. Most respondents to the questionnaire and the interview subjects noted a racing heart or increased blood pressure. While the subjects were no doubt engaged in physical exertion, certainly some of this response can be attributed to the fear and anxiety related to the situation. A fear response was rated lower than anxiety in questionnaire responses but increased pulse rate and increased blood pressure are common responses to both. Based on the ratings of the fear response, it is possible that firefighters may not fully understand what is specifically causing them to react as they do.

As blood flow and pressure increase, the ability of GBMFD firefighters to perform assigned tasks will degrade (Clarkson, 2003). Clarkson specifically states that fine motor skills will be negatively affected. This could be particularly problematic if personnel are expected to manipulate the controls or fittings of a self-contained breathing apparatus during efforts to mitigate a mayday. Given that blood flow can increase up to 400%, the challenge for an incident commander in this situation is to recognize that firefighter rehabilitation will be even more important ("Stress – The Body's Response," 2013). As the need for rehabilitation increases, a

higher number of firefighters will be needed on scene to rotate crews through rehabilitation while continuing rescue and suppression efforts. If this is not recognized, it could lead to significantly larger issues for individual firefighters and the operation as a whole.

A racing or pounding pulse was noted by GBMFD interview subjects and questionnaire respondents. Both also noted the phenomenon of auditory exclusion. Other researchers noted that auditory exclusion can be explained at least partially by blood rushing past the ear drums when the pulse rate is in excess of 175 beats per minute (Gasaway, 2012f). Many interview subjects pointed to communications as being one of the most critical elements of the mayday incident they experienced. Auditory exclusion, or "tunnel hearing," may cause hearing to be focused on one thing, diminished overall, or completely absent. Auditory exclusion will make communications even more challenging for firefighters and the incident commander in the event of a mayday. Personnel may not hear orders or assignments. Personnel may also focus their hearing so intently on one sound that they miss a different sound that could be much more important.

GBMFD firefighters and questionnaire respondents stated that they had experienced or expect to experience the effects of the cue utilization theory, in which the brain becomes over-aroused by incoming information in a stressful environment (Kent, 2007). As a result, a firefighter's focus may not be directed where it should be. GBMFD incident commanders must recognize the safety implications of the "attentional blink" suggested by Kent. If the scene continues to degrade and visual cues continue to arrive, Patrick (2012) asserts it is possible that firefighters could get locked in the act of processing information rather than acting on it. During the interviews for this project, one interview subject described witnessing exactly such a circumstance. Cue utilization could contribute to freezing on an incident involving a mayday

declaration. Incident commanders will be challenged to find methods of refocusing a firefighter's attention in order to prevent cues from causing freezing behaviors.

The original research in this project clearly demonstrates that GBMFD firefighters respond in an expected and predictable manner to high-stress, dangerous circumstances. Additionally, this research showed that the response of GBMFD firefighters is also consistent with that of other firefighters. Other researchers have suggested that the best way to overcome the reactions caused by the fear response is to minimize them (Patrick, 2012). The organizational implication is that since the reactions are expected and predictable, processes can be developed and training conducted to minimize the effects of the reactions.

Recommendations

Research from this project indicates that the GBMFD would benefit from conducting training on firefighter's reactions to maydays, developing standard approaches to mayday declarations depending on incident types, and establishing and training on a priority communication system for incident communications during mayday declarations. All of the recommended actions will take some time to develop and implement. This research project and recommendations address the problem and purpose statement of the project by conducting an analysis of a firefighter's response to a mayday and recommending solutions to overcome adaptive challenges presented to incident commanders. Following through with these recommendations would enable a more effective response to an incident in which a mayday is declared. The ultimate goal of the recommendations is to ensure that any mayday declaration ends with the most positive outcome possible.

Incident commanders and firefighters should both be trained on their likely reactions during a mayday declaration. It is important to note that incident commanders will not be immune from these reactions and will be expected to manage their own as well as those of firefighters. Training should focus on both psychological and physiological reactions. Since research indicates that these reactions cannot be stopped, the training would assist firefighters and commanders to recognize and accept what is happening to them and others when they experience them. If both GBMFD commanders and firefighters understand that the reactions are normal and that they occur for specific reasons, they will be better prepared to minimize those reactions. GBMFD should include firefighters and commanders from all mutual aid partners when conducting this training. With training, commanders would be able to respond positively to adverse reactions experienced by personnel on a scene where a mayday has been declared.

Developing a standard approach to managing maydays of various incident types and training on those approaches would have a positive impact on the organization by enabling firefighters to revert to training under the stressful conditions of a mayday. A review of current mayday response procedures during fire incidents should be conducted to determine if they are still relevant and achievable given new information from this project. After review and any changes, GBMFD personnel should regularly conduct training on the new procedures. Response procedures of non-fire incidents may be significantly different than those for fire incidents. GBMFD should develop response procedures for mayday declarations during non-fire incidents and conduct training on those procedures. This would improve the organization's response to mayday declarations during non-fire incidents, as there are currently no procedures in place.

Establishing a priority communications system during mayday declarations would improve one of the most critical elements of any incident. Firefighters having firsthand

experience with a mayday declaration cited communications as a critical element in overcoming the challenges presented to incident commanders. A system that immediately eliminates all but the most important communications would help emphasize the need for particular attention to communications from the incident commander or other personnel. A system such as this may even serve to trigger a response from personnel who may have fixated on some other cue or become locked into processing information without acting.

As a whole, the fire service would benefit from further research surrounding a firefighter's reaction to another firefighter's mayday declaration. Research should focus on some of the more obscure reactions such as auditory exclusion, tunnel vision, and tachypsychia, as their specific impacts seem to be relatively unknown to the fire service. Furthermore, a broad study of firefighter reactions during mayday declarations may reveal additional reactions that are prevalent but as yet unknown. Finally, research regarding rapid stress relief techniques that would allow firefighters to refocus and gain some control of the body's response to stressful and dangerous situations would be beneficial. These areas of study could assist departments around the country to better understand, manage, and mitigate mayday declarations.

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Appendix A: Questionnaire and Responses

EFO Mayday impact questionairre

SurveyMonkey

1. Have you ever been working on an incident scene at the time that a MAYDAY was declared by a firefighter other than yourself?

	Response Percent	Response Count
Yes	24.1%	78
No	75.9%	245
answered question		323
skipped question		0

2. What psychological response(s) do you recall feeling at the time the MAYDAY was declared or at any time during efforts to resolve the MAYDAY situation? (check all that apply)

	Response Percent	Response Count
Fear	34.3%	24
Anger	4.3%	3
Anxiety	**61.4%**	**43**
Sadness	1.4%	1
Disbelief	21.4%	15
Surprise	44.3%	31
Upset	2.9%	2
Stress	50.0%	35
Fatigue	5.7%	4
Calm	17.1%	12
Alert	34.3%	24
Hypervigilance (heightened state of awareness)	50.0%	35
I wanted to leave the incident scene	0.0%	0
Time seemed to go faster	17.1%	12
Time seemed to go slower	18.6%	13
Felt like I was on "Auto Pilot"	20.0%	14
Felt like I couldn't move	1.4%	1
	answered question	**70**
	skipped question	**253**

3. What physiological (physical) responses do you recall feeling at the time the MAYDAY was declared or at any time during efforts to resolve the MAYDAY situation? (check all that apply)

	Response Percent	Response Count
Increased blood pressure (pounding pulse)	31.4%	22
Increased heart rate (fast pulse)	**82.9%**	**58**
Increased breathing rate	38.6%	27
Tunnel Vision	20.0%	14
Auditory Exclusion ("tunnel hearing" or reduced hearing)	11.4%	8
Loss of fine motor skills	1.4%	1
Exhaustion	8.6%	6
	answered question	**70**
	skipped question	**253**

4. Were there visual signs (smoke, fire, explosion, etc.) that indicated the severity of the emergency (fire, vehicle accident, technical rescue, etc.) when the MAYDAY was declared?

	Response Percent	Response Count
Yes	**71.4%**	**50**
No	28.6%	20
	answered question	**70**
	skipped question	**253**

5. Do you believe the visual signs contributed to the emotional and physiological responses you experienced when the MAYDAY was declared?

	Response Percent	Response Count
Yes	71.4%	35
No	28.6%	14
answered question		49
skipped question		274

6. What immediate psychological response(s) do you believe you would have if you heard a firefighter other than yourself declare a MAYDAY at an incident scene? (check all that apply)

	Response Percent	Response Count
Fear	41.4%	87
Anger	8.6%	18
Anxiety	64.8%	136
Sadness	4.8%	10
Disbelief	22.9%	48
Surprise	29.0%	61
Upset	9.5%	20
Stress	**71.0%**	**149**
Fatigue	3.8%	8
Calm	5.7%	12
Alert	33.8%	71
Hypervigilance (heightened state of awareness)	62.4%	131
I would want to leave the incident scene	1.0%	2
Time seemed to go faster	12.9%	27
Time seemed to go slower	7.6%	16
Feel like I was on "Auto Pilot"	9.0%	19
Feel like I couldn't move	1.9%	4
	answered question	**210**
	skipped question	**113**

7. What psychological response(s) do you believe you would have as efforts to resolve the MAYDAY situation continued over a period of time? (check all that apply)

	Response Percent	Response Count
Fear	37.1%	78
Anxiety	62.9%	132
Sadness	18.1%	38
Disbelief	21.9%	46
Surprise	8.1%	17
Upset	20.5%	43
Stress	**70.0%**	**147**
Fatigue	23.3%	49
Calm	5.2%	11
Alert	24.8%	52
Hypervigilance (heightened state of awareness)	40.0%	84
I would want to leave the incident scene	0.5%	1
Time would go faster	17.6%	37
Time would go slower	24.3%	51
Feel like I was on "Auto Pilot"	10.5%	22
Feel like I couldn't move	1.9%	4
	answered question	**210**
	skipped question	**113**

8. What immediate physiological (physical) response(s) do you believe you would have if you heard a firefighter other than yourself declare a MAYDAY at an incident scene? (check all that apply)

	Response Percent	Response Count
Increased blood pressure (pounding pulse)	74.3%	156
Increased heart rate (fast pulse)	**95.2%**	**200**
Increased breathing rate	62.9%	132
Tunnel Vision	27.1%	57
Auditory Exclusion ("tunnel hearing" or reduced hearing)	11.0%	23
Loss of fine motor skills	2.9%	6
Exhaustion	5.2%	11
	answered question	**210**
	skipped question	**113**

9. What physiological (physical) response(s) do you believe you would have as efforts to resolve the MAYDAY situation continued over a period of time? (check all that apply)

	Response Percent	Response Count
Increased blood pressure (pounding pulse)	63.8%	134
Increased heart rate (fast pulse)	**69.0%**	**145**
Increased breathing rate	47.6%	100
Tunnel Vision	19.0%	40
Auditory Exclusion ("tunnel hearing" or reduced hearing)	11.4%	24
Loss of fine motor skills	5.2%	11
Exhaustion	43.8%	92
	answered question	**210**
	skipped question	**113**

10. Do you believe that visual signs (smoke, fire, explosion, etc.) that would indicate the severity of an emergency (fire, vehicle accident, technical rescue, etc.) would contribute to the psychological and physiological responses you expect to experience if a MAYDAY was declared?

	Response Percent	Response Count
Yes	**96.2%**	**202**
No	3.8%	8
	answered question	**210**
	skipped question	**113**

11. Place yourself in the position of a firefighter who has just heard another firefighter declare a MAYDAY and rate the following statements:

	Agree	Neutral	Disagree	Rating Average	Rating Count
I would be more likely to operate outside of orders given by the incident commander if I felt it would benefit the firefighter declaring the MAYDAY.	**38.7% (106)**	25.9% (71)	35.4% (97)	0.00	274
I would be more likely to strictly follow the orders of the incident commander even if I thought doing something else would benefit the MAYDAY firefighter more.	40.1% (110)	**43.1% (118)**	16.8% (46)	0.00	274
I would ignore the direction of my company officer if I felt it would benefit the MAYDAY firefighter.	12.5% (34)	26.7% (73)	**60.8% (166)**	0.00	273
I would be more likely to strictly follow the orders of my company officer even if I thought doing something else would benefit the MAYDAY firefighter more.	**47.8% (131)**	40.9% (112)	11.3% (31)	0.00	274
I would be more willing to place my own life at risk in a MAYDAY situation than in any other situation.	**77.0% (211)**	17.9% (49)	5.1% (14)	0.00	274
			answered question		**274**
			skipped question		**49**

Appendix B: Interview Questions and Summary of Responses

1. When you heard the mayday called, what were your most prominent physical or emotional reactions?

   Summary of comments related to emotional reactions:

   "There was a sense of urgency."

   "Fear, because of all the fire blowing out of the house."

   "First we saw the backdraft, which made it all worse."

   "As we walked toward the house, the door was a wall of flame."

   "It was a punch in the gut kind of feeling."

   "Time went slow, things didn't happen fast enough."

   "I was concerned for the person calling the mayday."

   "I had a sinking feeling, like this wasn't going to end well."

   "It was a lot of hectic emotions."

   Summary of comments related to physical reactions:

   "My hearing was more prominent."

   "Initially, I was fine but then I just crashed after the adrenaline wore off."

   "My heart was racing."

   "I felt sick to my stomach."

   "I felt my hands shaking while I was putting on my face piece."

   "My hearing seemed worse, especially for the radio traffic."

   "My hearing was more tuned to a given area listening for the PASS device."

   "I felt a huge rush of adrenaline."

2. What were the most prominent physical or emotional reactions you witnessed in others?

   Summary of comments related to emotional reactions of others:

   "One person appeared calm."

   "He was afraid of failure, not that something bad would happen to him."

   "I saw emotional exhaustion."

   "A few people looked defeated."

   "On one person, you could tell the wheels were spinning, like they were trying to make a game plan."

   "…like they were in a trance."

"Some looked kind of wild-eyed."

3. Did you do anything that was outside or contrary to the orders of your company officer or the incident commander during attempts to mitigate the mayday? If so, why?

   Summary of responses:

   Seven interview subjects indicated that they did not do anything outside of orders. However, one subject said that he didn't have clear direction so he could not have gone against orders. Several interview subjects stated that orders were very broad, making it easy to stay within them. One subject said that he felt if he had gone against orders it might have gone better because of communications problems. One subject said that certain actions were taken without the company officer's knowledge.

4. Did you see anyone do anything that was outside or contrary to the orders of your company officer or the incident commander during attempts to mitigate the mayday? If so, why?

   Summary of responses:

   None of the eight interview subjects witnessed anyone do anything outside of or contrary to orders.

5. Based on your experience, do you believe that others will understand how they will react when they hear a mayday?

   Summary of responses:

   Six of eight interview subjects stated that they did not believe people would be prepared for how they would respond if a mayday were declared. Two people added that they felt people could be trained to understand how they would respond. One interview subject stated that only people who have experienced it would be prepared for their reactions. One person said he did not know if others would be prepared.

6. What challenges do you believe these reactions will or did cause for the incident commander?

   Summary of responses:

   Four respondents stated that communications would be a challenge. Two stated that the IC should not expect a standard response from personnel because some may act irrationally or differently than expected. One respondent said that crews may not be paying full attention to the orders they are given, or they might not be able to carry them out. One person said that personnel might freeze up. Two people stated that the adrenaline surge would cause personnel to be more aggressive than usual. One responded that the incident commander's challenge might be their own reaction to the mayday. One stated that tasks may take longer

than usual to perform. One stated that the challenge would be putting together a good plan because of the stress. One stated that developing a common operating picture and controlling the scene would be challenging.

7. How do you think the incident commander or firefighters can overcome those challenges?

   Summary of responses:

   All eight interview subjects stated that training of personnel prior to a mayday declaration occurring could help to overcome challenges. Three responded that the incident commander and firefighters must remain calm and show confidence. Two stated that taking Rapid Intervention assignments seriously will have a positive impact on challenges. One stated that the IC must clear the radio channel of unnecessary radio traffic. One responded that cultural changes were needed to overcome the challenges. One stated that the IC must understand the reactions occurring in the personnel on the scene. One stated that a communication priority system should be established to address communications challenges.